IN THE UNITED STATES PATENT & TRADEMARK OFFICE

Application No.:	10/710,368
Filing Date:	July 5, 2004
Inventor (first named):	Scott Thompson
Group Art Unit:	2831
Examiner Name:	CHAU N. NGUYEN
Attorney Docket No.:	53797.23

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I hereby certify that this document is being electronically transmitted on this date April 2, 2008 to the U.S. Patent and Trademark Office, Attention: Examiner Chau N. Nguyen, at Group Art Unit 2831 in Alexandria, VA 22313-1450

TANIA AUSTIN

DATED: April 2, 2008

APPEAL BRIEF UNDER 37 C.F.R. 41.37
IN RESPONSE TO FINAL OFFICE ACTION MAILED NOVEMBER 2, 2007

To: Assistant Commissioner for Patents
Washington, DC 20231

Dear Sir or Madam:

Notice of Appeal was timely filed February 4, 2008, and the following Appeal Brief is filed within two months of filing the Notice of Appeal.

Applicant is providing an Appeal Brief under 37 C.F.R. 41.37(c)(1), with regard to claims 1-10.

APPEAL BRIEF UNDER 37 C.F.R. 41.37(C)(1)

Applicant provides this Appeal Brief under 37 C.F.R. 41.37(c)(1). The Appeal Brief is filed within the time allowed for Appeal Brief of two months after filing the Notice of Appeal under 37 C.F.R. 41.37(a)(1). The fee for this Appeal Brief is $255.00 under 35 U.S.C. 41(a)(6)(B). Fee payment by Credit Card form is transmitted herewith.

(i) Real Party in Interest

The real parties in interest are the applicants Scott Thompson, Sofiane Benhaddad and Trevor Kwasnycia.

(ii) Related Appeals and Interferences

There are no prior or other pending appeals, judicial proceedings or interferences known to the Appellant which may be related to, directly affect or be directly affected by or have any bearing on the Board's decision in the pending appeal.

(iii) Status of Claims

Claims 1-10 are rejected and are under appeal.

(iv) Status of Amendments

No amendments have been filed subsequent to the final rejection mailed November 2, 2007.

(v) Summary of Claimed Subject Matter

The present invention is directed to a flexible electrical conductor cable for use in very high temperature applications, notably environments above 700°C (for example, solid oxide fuel cells and high temperature fuel cells). The present invention seeks to overcome the problem of

thermal degradation commonly encountered with prior art cables upon exposure to high temperatures. The present invention also addresses the problem of unacceptably high voltage drops when prior art cables are used with a DC power source such as a fuel cell. The cable of the present invention is designed to withstand high temperatures, display an adequately low electrical resistance, and survive repeated thermal cycling from ambient temperatures to operating temperatures.

According to Figures 1 and 2, independent claims 1 and 6 are directed to an electrical conducting cable comprising a conducting core (12) with a corrugated flexible, gas impermeable sheath (14). The corrugations in the sheath (14) confer flexibility to the cable. The core (12) is connected to solid one-piece terminal lugs (16) at each end. The core (12), the sheath (14) and the terminal lugs (16) are hermetically sealed by vacuum brazing, thereby ensuring that the cable performs satisfactorily at high temperatures without necessitating an insulating layer between the sheath (14) and the conducting core (12).

The components of the cable are formed of materials suitable for high temperature applications. In one embodiment, the conducting core (12) comprises a highly conductive metal or metal alloy which may comprise copper, nickel, aluminum or silver, or alloys thereof. In one embodiment, the sheath (14) may comprise stainless steel or any other oxidation resistant alloy. In one embodiment, the terminal lug (16) may be formed of stainless steel or other conductive metal.

Support for independent claim 1 resides in Figures 1 and 2 and in paragraphs [0013]-[0018]. Support for independent claim 6 resides in Figures 1 and 2 and in paragraphs [0013] and [0017].

A listing of claims 1-10 is set forth in the Claims Appendix below.

(vi) Grounds of Rejection to be Reviewed on Appeal

1. Whether claims 1-10 are properly rejected under 35 U.S.C 103(a) as being obvious in light of Leuchs *et al.* (US 4,297,526) in view of Thomas (US 5,538,294).

<u>(vii) Argument</u>

1. Whether claims 1-10 are properly rejected under 35 U.S.C 103(a) as being obvious in light of Leuchs *et al.* (US 4,297,526) in view of Thomas (US 5,538,294).

Examiner has rejected claims 1-10 under 35 U.S.C. 103(a) as being obvious in light of Leuchs *et al.* (US 4,297,526) in view of Thomas (US 5,538,294).

The Examiner has selected Leuchs *et al.* as the primary reference upon which the claim rejection has been based; however, the rejection acknowledges that the following elements or limitations, all of which are recited in claims 1 and 6, are <u>not</u> taught by Leuchs *et al.*:

- the cable comprising solid one-piece terminal lugs at each end,
- the outer surface of the sheath being hermetically sealed using a heat resistant braze to the lugs.

In spite of these multiple deficiencies, the Examiner has rejected claims 1-10 as obvious for the reasons set out in paragraph 3 of the Office Action. Applicants respectfully remind of the requirements for a proper obviousness rejection, among which the following were articulated in *KSR International Co. v. Teleflex Inc., 550 U.S. __, 82 USPQ2d 1385 (2007)*:

1) When a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious.

2) A combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.

3) When prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious.

It is respectfully submitted that a *prima facie* case for obviousness has not been made. Leuchs *et al.* relates to an electrical cable (10) comprising a core assembly (1) formed of a plurality of insulated conductors (4), and a metallic sheath (2) comprised preferably of aluminum and concentrically positioned about the core assembly (1) (col. 2, lines 47-56). A filler material (3)

of an expandable thermoplastic material "is dispersed within the spaces between the inner surface of the metallic sheath (2) and the outer surfaces of the insulated conductors (4), including the intermediate spaces between such conductors" (col. 2, lines 57-68 to col. 3, lines 1-8; Figures 1-3). When subjected to elevated temperatures, the filler material emits extinguishing oxides, and expands in volume (highlighting added for emphasis):

> Upon the continued subjection of a segment of the metallic sheath to concentrated heat; e.g., a localized fire, extinguishing oxides are emitted from the filler material positioned within the heated segment, which combine with at least a portion of the <u>acids and gases resulting from insulation decomposition</u> and, in combination, the volume of such filler material within the heated segment, expands to provide substantially complete cross-sectional occupation of any hollow spaces within the heated segment, resulting in a structural blockage to the longitudinal flow of acids and gases from within the heated segment into adjacent segments of the electrical cable (col. 2, lines 24-36).

As further described in Example 2, Leuchs *et al.* states that the electrical cable (10) is initially protected by the metallic sheath (highlighting added for emphasis):

> However, as the fire continues, <u>a significant portion of the heat will be transmitted to the interior of the electrical cable 10</u>. Upon the temperature of the filler material 3 within the heated cable segment exceeding a predetermined value, extinguishing oxides emitted from the filler material 3 are made available for combination with a major portion of the corrosive <u>poisonous acids and gases that result from the decomposition of the insulation material encapsulating the insulated conductors 4.</u> Initially the circumferential mechanical strength of the hermetically sealed, metallic sheath 2 is sufficient to withstand the increasing internal pressures resulting from the decomposition of the insulating material. As the filler material 3 is so structured that its volume expands as a consequence of the increased temperature, and in view of the tight fit or engagement between the core assembly 1 and the metallic sheath 2, the expanded filler material provides for substantially complete, cross-sectional occupation of the previously hollow or unoccupied spaces between the metallic sheath 2 and the core assembly 1, within the heated longitudinal segment. Consequently, the longitudinal flow of acids and gases to other segments of the electrical cable 10 is substantially blocked (col. 3, lines 34-57).
>
> Although the metallic sheath 2 of the electrical cable 10 provides initial excellent protection because of its efficient, longitudinal heat conductance, against any localized concentration of heat; e.g., a fire, <u>the continued application of such heat will cause insulation decomposition and excessive pressure conditions within the metallic sheath 2 that will ultimately burst the metallic sheath 2</u>. Prior to <u>this eventuality,</u> the major portion of the <u>corrosive and poisonous acids and gases resulting from the decomposition of the insulation</u>, combine with the extinguishing gases emitted from the heated filler material 3.

> If the metallic sheath 2 bursts at a particular location along the electrical cable 10, the uncombined gases from the decomposition of the insulation material escapes into the surroundings, but the cross-sectional blockage resulting from the aforesaid expanded filler material 3 within the heated segment of the electrical cable 10 prevents the longitudinal spread of the fire within the electrical cable 10 (col. 3, lines 58-68 to col. 4, lines 1-8).

The Office Action contends that Leuchs *et al.* discloses the sheath as comprising a corrugated metal resistant to oxidation. Applicants respectfully disagree. As indicated in the above highlighted passages, Leuchs *et al.* states that the cable is subject to the "eventuality" of insulation decomposition and bursting of the metallic sheath upon continued exposure to high temperatures. This is in fact an admission of failure of the cable.

In spite of this admission of problems, the Office Action contends that Leuchs *et al.* discloses the sheath comprising steel but not stainless steel, and that it would have been obvious to use stainless steel for the sheath of Leuchs *et al.* since stainless steel is known for its corrosion properties. Applicants respectfully disagree. Leuchs *et al.* generally mentions copper, aluminum, steel or lead in reference to typical electrical cables in the background of the invention (col. 1, line 27), but explicitly states that the metallic sheath (2) is "preferably formed of aluminum" (col. 2, line 57). No other material or stainless steel is contemplated. The melting points of these elements/alloys are set out below:

Element/Alloy	**Melting point (°C)***
Lead	327
Aluminum	660
Copper	1083
Plain carbon steel	1130
Pure iron (steel with 0% carbon)	melts at 1492 (liquid at 1539)
Steel (2.1% carbon)	melts at 1130 (molten at 1315)
Stainless steel	ranges from 1400-1500 depending upon chemical composition of alloy

* data for aluminum, copper and lead from The Merck Index, 13th Edition, eds. O'Neil *et al.*, 2001, Merck & Co., Inc.; data for steel from Wikipedia; data for stainless steel from ASM Specialty Handbook: Stainless Steels, ed. Davis, 1994, ASM International

Aluminum has a substantially lower melting point (approximately two-fold lower) in comparison to steel and stainless steel. Leuchs *et al.*, regardless of its general background teachings on materials other than aluminum, did not find it so obvious to solve its admitted problems with

either steel or stainless steel. These problems illustrate that the electrical cable of Leuchs *et al.* is not compatible with the present invention.

The present invention does not constitute a predictable use of prior art elements. In contrast to Leuchs *et al.*, the present invention overcomes the problem of thermal degradation since the electrical conductor cable is specifically designed to withstand very high temperature applications, notably environments above 700°C (for example, solid oxide fuel cells and high temperature fuel cells). As shown in Figures 1 and 2, no filler material or insulating layer is disposed between the sheath and cable insulation, as required in Leuchs *et al.*'s cable. Rather, the core (12), the sheath (14) and the terminal lugs (16) are "hermetically sealed" by vacuum brazing, thereby ensuring that the cable performs satisfactorily at high temperatures without necessitating any insulating layer between the sheath (14) and the conducting core (12). The core (12) is fully encased within the sheath (14) and is not exposed at its ends since the sheath (14) is "hermetically sealed" to the terminal lugs (16), meaning no gas or vapor can enter or escape. The sheath (14) itself is "gas impermeable." Consequently, the electrical conductor cable in its entirety can withstand high temperature environments. Thus, the language of independent claims 1 and 6 distinguishes the teachings of Leuchs *et al.*

In the present invention, the components are formed of "oxidation resistant alloy" materials suitable for high temperature applications. With regard to the core (12), the specification explicitly states that "aluminum may be used as an alloying element in smaller quantities; however, it cannot be used in pure form because of its relatively low melting temperature" (paragraph [0014]). The sheath (14) and terminal lugs (16) are formed of stainless steel or any other oxidation resistant alloy. The present invention thus does not advocate use of aluminum – which in fact is not an alloy as understood by those skilled in the art. Leuchs *et al.*, in emphasizing a preference for aluminum, teaches away from combining the references as indicated by the Office Action. The very reference relied on for this §103 rejection did not recognize the enormous advantages to be gained by forming its components of oxidation resistant alloy. Leuchs *et al.* has no teachings related to oxidation resistant alloys, or solving the issue of thermal degradation of its cable. Thus, the language of independent claim 1 which recites "an oxidation resistant alloy" distinguishes the teachings of Leuchs *et al.*

The Office Action states that it would have been obvious to combine Thomas with Leuchs *et al.* to arrive at the present invention. Thomas is cited for its teachings related to "a sheath (24) having solid one-piece terminal lugs at each end, wherein the outer surface of the sheath is hermetically sealed to each of the lugs (30)." Thomas does not relate to cables, but to a metal piping assembly including

> a body 24 which terminates at opposite male-threaded ends 28 each adapted to receive a connecting nut 30 having proximate and distal female-threaded receiver portions 32a, 32b. Each connecting nut is adapted to receive a respective male-threaded fitting, pipe end or the like (col. 3, lines 27-36; Figure 2).

The connecting nut (30) is simply threaded onto respective threads of the body (24); thus, features (24) and (30) do not even equate to the sheath (14) and terminal lugs (16) of the present invention. Thus, the Thomas reference does not remedy any of the deficiencies of Leuchs *et al.*, nor is it seen to be properly combinable with Leuchs *et al.*, there being no recognition within the reference itself of the problem to be solved nor how to solve it. There is no reasonable expectation of success or operability from combining Leuchs *et al.* with Thomas to arrive at the present invention. As well, the claimed features of independent claims 1 and 6 are not present in any of the references, alone or in combination.

For these reasons, it is believed improper to reject any of claims 1-10 under 35 U.S.C. §103. The claimed invention is not a predictable use of prior art elements. The prior art teaches away from the present invention, indicating that there is no reason for one skilled in the art having common sense to make the asserted combination. Even if combined, the prior art does not yield the claimed invention or disclose each limitation in the claims. A *prime facie* case of obviousness has not been established. In summary, claims 1-10 are not believed to be anticipated or rendered obvious in view of the cited prior art. Reconsideration and withdrawal of all claim rejections under 35 U.S.C. §103, and allowance of claims 1-10 are thus respectfully requested.

(viii) Claims Appendix

1. (Previously Presented) A single electrical conducting cable comprising:

(a) a conductive core having solid one-piece terminal lugs at each end, wherein said lugs comprise an oxidation resistant alloy;

(b) a single gas impermeable sheath comprising an oxidation resistant alloy and having an inner surface and an outer surface, the outer surface of which is hermetically sealed using a heat resistant braze to each of the terminal lugs, thereby entirely encasing the conductive core.

2. (Original) The cable of claim 1 wherein the conductive core comprises copper, nickel, aluminum, or silver, or alloys thereof.

3. (Original) The cable of claim 2 wherein the conductive core comprises copper.

4. (Previously Presented) The cable of claim 1 wherein the sheath is flexible and comprises a corrugated metal resistant to oxidation.

5. (Original) The cable of claim 4 wherein the corrugated metal comprises a stainless steel.

6. (Previously presented) An electrical conducting cable consisting essentially of:

(a) a conductive core having solid one-piece terminal lugs at each end;

(b) a single gas impermeable sheath having an inner surface and an outer surface, the outer surface of which is hermetically sealed to each of the terminal lugs.

7. (Original) The cable of claim 6 wherein the conductive core comprises copper, nickel, aluminum, or silver, or alloys thereof.

8. (Original) The cable of claim 7 wherein the conductive core comprises copper.

9. (Previously Presented) The cable of claim 6 wherein the sheath is flexible and comprises a corrugated metal resistant to oxidation.

10. (Original) The cable of claim 9 wherein the corrugated metal comprises a stainless steel.

(ix) Evidence Appendix

There has been no evidence submitted under 37 C.F.R. 1.130, 1.131 or 1.132.

Copies of evidence relied upon as grounds of rejection in Final Office Action dated November 2, 2007 are listed below.

1. US 4,297,526 to Leuchs *et al.*

2. US 5,538,294 to Thomas

(x) Related Proceedings Appendix

None.

Respectfully submitted,

Scott Thompson, et al.

By: ______________________
Simon Foxcroft (Reg. No. 56,279)

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